



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

June 8, 2018

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Chief Medical Officer

A. ACCIDENT: CEN17FA288; Laddonia, MO

On July 27, 2017, at 0452 central daylight time, a Zenith CH 701SP, N701XP, piloted by a sport pilot, was destroyed when it impacted a bean field about 6.5 miles north of Laddonia, or 16.5 miles northeast of Mexico, Missouri. Instrument meteorological conditions prevailed at the time of the accident. The personal flight was being conducted under the provisions of Title 14 Code of Federal Regulations Part 91, and no flight plan had been filed. The pilot and the passenger on board the airplane were fatally injured. The cross-country flight originated from Mexico Municipal Airport (MYJ), Mexico, Missouri, about 0440, and was en route to Oshkosh (OSH), Wisconsin.

B. GROUP IDENTIFICATION

No group was formed for the medical evaluation in this accident.

C. DETAILS OF INVESTIGATION

1. Purpose

This investigation was performed to evaluate the pilot for any medical conditions, the use of any medications/illicit drugs, and the presence of any toxins.

2. Methods

The FAA medical case review, autopsy report, toxicology findings, personal medical records, pharmacy records, and the investigator's reports were reviewed.

FAA Medical Case Review

According to the FAA medical case review, the 41 year old male sport pilot had never applied for an aviation medical certificate. At the time he obtained his sport pilot certificate, he reported he was 70 inches tall and weighed 160 pounds.

Autopsy

According to the autopsy performed by Boone/Callaway County Medical Examiner's Office, the cause of death was blunt force injuries. The brain was not examined, due to the extent of injury but no natural disease was identified.

Toxicology

Toxicology testing performed by the St. Louis University Toxicology Laboratory identified 0.040 gm/dl of ethanol in blood but none in urine as well as 0.11 ug/ml of temazepam, 0.91 ug/ml of sertraline, and 33 ug/ml of acetaminophen in blood.

Toxicology testing performed by the FAA's Bioaeronautical Sciences Research Laboratory identified 0.036 gm/dl of ethanol in blood and 0.010 gm/dl in urine. N-propanol was also identified in urine and blood. In addition, 0.007 ug/ml of dihydrocodeine, 0.086 ug/ml of temazepam, 1.23 ug/ml of sertraline and 2.895 ug/ml of its metabolite desmethylsertraline were identified in blood. All of these substances and acetaminophen, hydrocodone and its metabolite hydromorphone, temazepam and its metabolite oxazepam, and salicylate were found in urine.

Ethanol is the intoxicant commonly found in beer, wine, and liquor. It acts as a central nervous system depressant. After ingestion, at low doses, it impairs judgment, psychomotor functioning, and vigilance; at higher doses it can cause coma and death. The effects of ethanol on aviators are generally well understood; it significantly impairs pilots' performance, even at very low levels.¹ Federal Aviation Regulations, Section 91.17 (a) prohibits any person from acting or attempting to act as a crewmember of a civil aircraft while having 0.040 gm/dl or more ethanol in the blood.² Because ingested alcohol is distributed throughout the body, levels from different post mortem tissues are usually similar. Ethanol may also be produced in body tissues by microbial activity after death.³ In this case, the levels in various tissues and fluids varied widely. N-propanol is another type of alcohol that can be produced in post mortem tissues; it is not ingested.

Temazepam, commonly sold with the name Restoril, is a sedating benzodiazepine Schedule IV controlled substance available by prescription and intended for the short term treatment of insomnia. It carries a number of warnings including, "Concomitant use of benzodiazepines, including temazepam, and opioids may result in

¹ Cook, C.C., Alcohol and aviation. *Addiction* (Abingdon, England), 1997. 92(5): 539-555.

² US Government Printing Office .eCFR- Code of Federal Regulations. 91.17. <http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=14:2.0.1.3.10.1.4.9>. Accessed 6/16/2018.

³ Federal Aviation Administration. Forensic Toxicology Drug Information. Ethanol. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=60> Accessed 12/02/2017.

profound sedation, respiratory depression, coma, and death.” A second warning is that temazepam can cause behavior changes such as increased aggressivity, and patients using it may engage in complex behaviors while under its influence such as “sleep driving” that they may later be amnesic to.⁴ The range of blood levels where temazepam is thought to demonstrate activity are between 0.0170 and 0.1320 ug/ml.⁵ Oxazepam is a psychoactive metabolite of temazepam.

The FAA has issued guidance to its aviation medical examiners regarding the use of sleep aids by pilots. Because many of these drugs can persist in the system for many hours, the FAA allows occasional use but recommends specific wait periods between the last use of the drug and returning to flight. For temazepam, the recommended waiting period is 72 hours.⁶

Sertraline is an antidepressant available by prescription and commonly sold with the name Zoloft. While the drug itself is not considered impairing, the underlying depression is associated with significant cognitive degradation, particularly in executive functioning.⁷ The cognitive degradation may not improve even with remission of the depressed episode, and patients with severe disease are more significantly affected than those with fewer symptoms or episodes.^{8,9} As a result, the FAA requires additional evaluation of pilots being treated with an antidepressant.¹⁰

Acetaminophen is an analgesic available over the counter and commonly marketed with the name Tylenol. It is not impairing. However, it is commonly combined with opioids into a single pill.

⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Temazepam. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a4370eb4-b00d-4247-af8d-980e59fbbec6> Accessed 6/8/2018.

⁵ Federal Aviation Administration. Forensic Toxicology Drug Information. Temazepam. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=193> Accessed 6/8/2018.

⁶ Federal Aviation Administration. Guide for Aviation Medical Examiners. Pharmaceuticals (Therapeutic Medications) Sleep Aids https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/sleepaids/ Accessed 6/8/2018.

⁷ Snyder H. Major depressive disorder is associated with broad impairments on neuropsychological measures of executive function: A meta-analysis and review. *Psychol Bull*, 2013. 139(1): p. 81-132.

⁸ Nakano Y, Baba H., Maeshima H, Kitajima A, Sakai Y, Baba K, Suzuki T, Mimura M, Arai H. Executive dysfunction in medicated, remitted state of major depression. *J Affect Disord*, 2008. 111(1): p. 46-51.

⁹ Paelecke-Habermann Y, Pohl J, Lepow B. Attention and executive functions in remitted major depression patients. *J Affect Disord*, 2005. 89(1-3): p. 125-135.

¹⁰ Federal Aviation Administration. Airman Medical Examiner's Guide, 2013. Issued Jan 03, 2013. http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/media/guide.pdf Pg. 211. Accessed 1/15/2013

Hydrocodone is an opioid analgesic available as a Schedule II controlled substance that is commonly combined with acetaminophen and marketed with the names Lortab, Vicodin, and Norco. It is considered impairing and carries warnings about risks of central nervous system and respiratory depression, particularly when combined with benzodiazepines. In addition, the drug information warns, “may impair the mental or physical abilities needed to perform potentially hazardous activities such as driving a car or operating machinery.” Hydromorphone and dihydrocodeine are psychoactive metabolites of hydrocodone.¹¹

Salicylate is a urinary metabolite of aspirin, an analgesic available over the counter that also has anti-platelet activity. It is not considered impairing.

Personal Medical Records

Records for the 3 years preceding the accident were obtained from the pilot’s primary care physician. The records indicate the pilot had been treated with 4 tablets a day of hydrocodone/acetaminophen (5/325mg) as needed (no diagnosis in the record related to this medication), temazepam 15-30 mg at bedtime for insomnia, and sertraline 100 mg daily for anxiety since August 2016. However, there is no documentation in the records of the status of the pilot’s insomnia and anxiety symptoms since September 2016. There are a number of follow up visits for a variety of other issues through May 2017. Pharmacy records obtained through the pilot’s mother indicate he regularly refilled his temazepam and sertraline; there were no filled prescriptions for hydrocodone in the provided pharmacy records which began January 1, 2017.

D. SUMMARY OF MEDICAL FINDINGS

The 41 year old male pilot had a history of chronic insomnia treated with temazepam, anxiety requiring treatment with sertraline, and was regularly prescribed hydrocodone. He had never applied for an aviation medical certificate and was legally allowed to operate his light sport aircraft as long as he maintained a valid driver’s license.

Toxicology testing performed by the St. Louis University Toxicology Laboratory identified 0.040 gm/dl of ethanol in blood but none in urine. In addition, 0.11 ug/ml of temazepam, 0.91 ug/ml of sertraline, and 33 ug/ml of acetaminophen were confirmed in blood.

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¹¹ National Institutes of Health. US National Library of Medicine. DailyMed. Hydrocodone. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=fa32969f-7210-47ec-bbd1-f62bea8989a7> Accessed 6/8/2018.

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